Progressive Education Society's

Modern college of Arts, Science and Commerce,

Ganeshkhind,Pune-16

Autonomous

NEP 2020 (1)

Department of Mathematics

(Under Faculty of Science and Technology)

S.Y.B.Sc.(Regular) : Minor : Mathematics

Choice Based Credit System Syllabus

To be implemented from Academic Year 2024-2025

S.Y.B.Sc. (Regular) : Minor : Mathematics

Semester	Paper Code	Title of the Paper	Theory / Practical	No. of Credits
3	MAT23201	Practical based on Operations Research	Practical	2
4	MAT24201	Optimization Techniques	Theory	2
	MAT24202	Practical based on Optimization Techniques	Practical	2

Semester - 3

Details of Syllabus

Paper Code : MAT23202

Name of the Paper : Practical based on MAT23201 (Practical)

Total No. of Credits : 2 **Total No. of Practical : 15**

Unit	Sub Unit	Content
1	**Linear Programming Problem I**	
	1.1	Introduction Definition and Examples.
	1.2	Problem solving using Graphical Method.
	1.3	Theory of Linear Programming , Slack and Surplus variables , Standard form of Linear Programming Problem (LPP).
	1.4	Duality in Linear programming , Primal to Dual conversion , Examples.
2	**Assignment Models**	
	2.1	Assignment Model – Introduction.
	2.2	Hungerian Method for Assignment problem
3	**Transportation Models**	
	3.1	Introduction , Tabular representation.
	3.2	Methods of IBFS (North-West rule , Matrix-minima , Vogel's Approximation) , Algorithms.
	3. 3	The Optimality test of Transportation Model (MODI method only)

Text Book

Operations Research (12^{th} Edition) by S. D. Sharma.

List of Practicals

Practical 1. Written practical on Unit 1 of MAT23201.

Practical 2. Written practical on Unit 1 of MAT23201.

Practical 3. Written practical on Unit 1 of MAT23201.

Practical 4. Written practical on Unit 1 of MAT23201.

Practical 5. Written practical on Unit 1 of MAT23201.

Practical 6. Written practical on Unit 2 of MAT23201.

Practical 7. Written practical on Unit 2 of MAT23201.

Practical 8. Written practical on Unit 2 of MAT23201.

Practical 9. Written practical on Unit 3 of MAT23201.

Practical 10. Written practical on Unit 3 of MAT23201.

Practical 11. Written practical on Unit 3 of MAT23201.

Practical 12. Miscellaneous / Introduction to software.

Practical 13. Miscellaneous / Introduction to software.

Practical 14. Miscellaneous / Introduction to software.

Practical 15. Miscellaneous / Introduction to software.

Semester - 4

Details of Syllabus

Paper Code : MAT24201

Name of the Paper : Optimization Techniques (Theory)

Total No. of Credits : 2 **Total No. of Practical : 30**

Course Objectives:
This course enables the students to get an idea about the
i) Network and basic components, Determination of critical path: Critical Path Method (CPM),Project Evaluation and Review Techniques(PERT).Time-cost optimization Algorithm.
ii) Problem of Sequencing, Processing n Jobs through Two Machines, Processing n Jobs through 3 Machines and Processing n Jobs through k Machines.

Course Learning Outcomes : The course will enable the students to:	
CO1	Understand fundamentals of Network Analysis using CPM and PERT.
CO2	Solve a sequencing Problem for various jobs and machines.

Course Contents

Unit 1: Network Models **[06 Lectures]**
1.1 CPM and PERT, Network representation
1.2 Construction of the time schedule, PERT networks.

Unit 2: Game Theory **[12 Lectures]**
2.1 Game theory, some basic terminologies
2.2 Optimal solution of two person zero sum game
2.3 Algebraic Method
2.4 Dominance Principle
2.5 Subgame Method.
2.6 Solution of mixed strategy games.

Unit 3: Replacement and Maintenance Models **[06 Lectures]**
3.1 Introduction, Types of failure

3.2 Replacement of items whose efficiency deteriorates with time.

Unit 4: Sequencing Problems [06 Lectures]

4.1 Introduction, Notation, terminology and assumptions

4.2 Processing n jobs through two machines, Processing n jobs through three machines.

Text Books

1. J K Sharma, Operations Research (Theory and Applications, second edition, 2006), Macmilan India Ltd.

2. Hamdy A. Taha, Operation Research (Eighth Edition, 2009), Prentice Hall of India Pvt. Ltd, New Delhi.

Reference Books

1. Frederick S. Hillier, Gerald J. Lieberman, Introduction to Operation Research (Eighth Edition) Tata McGraw Hill.

2. Hira and Gupta, Operation Research.

Paper Code : MAT24202

Name of the Paper : Practical based on Optimization Techniques

(Practical)

Total No. of Credits : 2 **Total No. of Practical : 15**

List of Practicals

Practical 1. Written practical on Unit 1.

Practical 2. Written practical on Unit 1.

Practical 3. Written practical on Unit 1.

Practical 4. Written practical on Unit 2.

Practical 5. Written practical on Unit 2.

Practical 6. Written practical on Unit 2.

Practical 7. Written practical on Unit 3.

Practical 8. Written practical on Unit 3.

Practical 9. Written practical on Unit 3.

Practical 10. Written practical on Unit 4.

Practical 11. Written practical on Unit 4.

Practical 12. Miscellaneous / Introduction to software.

Practical 13. Miscellaneous / Introduction to software.

Practical 14. Miscellaneous / Introduction to software.

Practical 15. Miscellaneous / Introduction to software.

Modalities for conducting practical and practical Examination:

1) There will be 4 hour practical session per 15 students batch per week.
2) A question bank consisting of 50 problems in all for each semester, will be the course work for this paper. Question bank will be prepared by the individual subject teacher and the problems included should be changed every year.
3) Each student will maintain a journal to be provided by the college.
4) The internal 20 marks will be given on the basis of journal prepared by student and the cumulative performance of student at practical.
5) Practical examination will consist of written examination of 30 marks.
6) Written examination will be of 25 marks and oral examination 5 marks.
7) The pattern for the practical written examination will be as follows:

   - **Solve any 5 questions out of 8 questions.**
   - **Each question will be of 5 marks.**

8) Study tours may be arranged at places having important mathematical institutes orhistorical places.

9) **Special Instruction**:

a) Before starting each practical necessary introduction, basic definitions and prerequisites must be discussed.

b) Examiners should set separate question papers, solutions and scheme of marking for each batch and claim the remuneration as per rule.